



*Consulting Engineers
and Scientists*

PASTOR, BEHLING & WHEELER, LLC
2000 S. Mays, Suite 300
Round Rock, TX 78664
Tel (512) 671-3434
Fax (512) 671-3446

June 21, 2005
(PBW Project No. 1259)

VIA E-MAIL

Mr. Gary Miller
Superfund Division, Region 6 (6SF-AP)
Arkansas/Texas Section
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Re: Site Investigation/Removal Action Scope of Work, Gulfco Marine Maintenance Site,
Freeport, Texas

Dear Mr. Miller:

Thank you for your comments on the Draft Site Investigation/Removal Action (SI/RA) SOW for the Gulfco Marine Maintenance Superfund Site (the Site) in Freeport, Texas. This SOW was prepared by Pastor, Behling & Wheeler, LLC (PBW) on behalf of LDL Coastal Limited LP (LDL), Chromalloy American Corporation (Chromalloy) and The Dow Chemical Company (Dow), and was submitted to EPA on May 5, 2005. EPA comments on this SOW were provided in our meeting on May 17, 2005 and were subsequently discussed in our telephone conversation on May 19, 2005, in your e-mail to me on May 20, 2005, in our meeting on June 8, 2005, and in June 13 and 17, 2005 telephone conversations. The attached Revised Draft SOW has been prepared in response to these comments and discussions. A summary of the comments provided on May 17 and corresponding responses explaining how each comment was addressed in the revised SOW is provided below.

In the responses provided below and the attached Revised Draft SOW, we believe we have directly addressed what we perceive to be EPA's two key overarching concerns discussed in our June 17, 2005 conference call. The first of these concerns was a request for specific commitments to perform contingent activities when indicated by the initial data collected. The stepwise approach building on the data for subsequent sound technical decisions is consistent with both EPA and TCEQ guidance including the TRIAD approach, which Mr. Coleman endorsed again on Friday. We have now coupled this approach with a clear, unequivocal commitment to conduct the further investigations which the data indicate are required. The commitments are provided in the Revised Draft SOW in Paragraph 19.g for soil, Paragraph 21.g for DNAPL, Paragraph 21.n for groundwater, Paragraph 22.f for surface water, and Paragraphs 23.f, 23.g, and 23.h for sediments.

The second overarching concern was the provision of adequate opportunities for EPA review and input during the investigative process. This concern appeared to drive some of EPA's comments on the SOW and was often expressed as a belief that EPA had only one opportunity to influence the scope of the investigation. We have addressed this concern directly. The opportunities for continued EPA involvement are provided in Paragraph 17 (review and approval of the Quality Assurance Project Plan), Paragraph 19.c (approval of any soil sample field analytical methods and associated Demonstrations of Method Applicability), Paragraph 19.e (approval of any literature values proposed to represent background soil concentrations), Paragraph 21.g (approval of any DNAPL field screening methods and associated Demonstrations of Method Applicability), Paragraph 21.h (approval of any groundwater sample field analytical methods and associated Demonstrations of Method Applicability), Paragraph 21.i (review and approval of any driller's log or literature information interpreted to represent Site stratigraphy), Paragraph 21.m (approval of any literature values proposed to represent background groundwater concentrations), Paragraph 22.e (approval of any literature values proposed to represent background surface water concentrations), Paragraph 23.e (approval of any literature values proposed to represent background sediment concentrations), Paragraph 23.h (review and approval of Fish/Crab Sampling Work Plan), Paragraph 26 (review and approval of Community Involvement Plan), Paragraph 29 (review and comment on Affected Property Assessment Report), and Paragraph 31 (review and comment on Response Action Plan).

COMMENTS AND RESPONSES

EPA Comment A (first): *A pathway for indoor air vapor intrusion to the neighboring residential area should be included as a possible route of exposure from groundwater and DNAPL migration. If contaminated groundwater is approaching the residential area off site, the vapor intrusion pathway will need to be evaluated.*

Response: This pathway has been added as Potential Exposure Route EE in the revised Conceptual Site Model shown on Figure 1.

EPA Comment B (first): *Include a Quality Control Project Plan (QAPP) in accordance with EPA guidance. Include sampling procedures, sample custody, analytical procedures, data reduction, data validation, data reporting, and personnel qualifications. Also include maximum sample holding times and type and amount of preservatives.*

Response: The requested QAPP is proposed in Task 2 (Paragraph 17.a), and will be submitted for EPA review and approval prior to initiation of SI field activities.

EPA Comment A (second): *Provide a demonstration that each analytical laboratory that may be used is qualified to conduct the proposed work. This includes use of methods and analytical protocols for the chemicals of concern in the media of interest within detection and quantification limits consistent with both QA/QC procedures and the DQOs presented in the QAPP. The laboratory should have, and follow, an approved QA program. If a laboratory not in the Contract Laboratory Program (CLP) program is selected, a laboratory QA program should be included in the WP.*

Response: The requested demonstration will be included in the QAPP as detailed in Paragraph 17.b.

EPA Comment B (second): *Characterize geology and hydrogeology to the drinking water aquifer at the Site.*

Response: The requested characterization, as clarified in our May 17 and June 8 discussions, will be performed as described in Paragraph 21.j.

EPA Comment C: *Include provisions for gathering all data necessary for calculations of contaminant fate and transport.*

Response: This general requirement has been added to Paragraph 13 and analysis of specific soil samples for fraction organic carbon (foc) had been added to the list of soil bulk property analyses provided in Paragraph 19.c and Table 1.

EPA Comment D: *Describe the decontamination procedures.*

Response: The requested information will be included in the QAPP as specified in Paragraph 17.d.

EPA Comment E: *List the analytes for all methods. For EPA methods SW-846 8260, 8270, 6010, 7470, 7471, 8081, and 8082 the analyte list should include all analytes covered by each method. Alternative analysis methods may be required to achieve the necessary detection limits.*

Response: The requested information will be included in the QAPP as specified in Paragraph 17.

EPA Comment F: *Activities [should be performed] in accordance with EPA guidance to facilitate delisting process.*

Response: SI activities will be performed in accordance with applicable or appropriate EPA guidance. This clarification has been added to Paragraphs 3 and 13.

EPA Comment G: *Measure in-situ permeability of cap at former impoundments to evaluate potential for vapor migration through cap, in addition to Atterburg Limits and 200 sieve.*

Response: Per discussions in our May 17, 2005 meeting, an undisturbed soil sample will be collected from each of the four former impoundment cap borings for laboratory hydraulic conductivity testing. This additional testing has been added to Paragraph 18.b and Table 1.

EPA Comment H: *Analytical Methods:*

1. *Surface water and ground water: Analytical methods with detection limits for all analytes as specified in the Ecological Benchmarks for Water, Table 3-2: "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas"; December 2001; RG-263 (revised), including any updates.*
2. *Sediment: Analytical methods with detection limits for all analytes as specified in the Ecological Benchmarks for Sediment, Table 3-3: "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas including any updates.*

3. *Soil north of Marlin Ave.: Analytical methods with detection limits for all analytes as specified in the EPA Ecological Soil Screening Levels; or Ecological Benchmarks for Soil, Table 3-4: "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas ", including any updates, for analytes not included in EPA's Ecological Soil Screening Levels.*
4. *Soil south of Marlin Ave.: EPA Region 6 Soil Screening Levels for commercial/industrial human health exposure.*

Response: As discussed in our May 17 meeting, this comment pertains to verifying that the quantification limits for the proposed analytical methods are sufficient to allow comparison of analytical results to appropriate screening criteria. This comment will be addressed in the QAPP to be submitted for EPA review and approval as part of Task 2.

EPA Comment I: *Soil Samples: (maximum 200 ft. grid spacing north of Marlin Ave; maximum 100 ft grid spacing south of Marlin Ave; and 20 biased samples)*

1. *Samples should be collected from one randomly selected location within each grid block.*
2. *Sample @ 0" - 6", for semi-volatiles, pesticides, PCBs, and metals analysis.*
3. *Sample @ 12" - 24", for volatiles, semi-volatiles, pesticides, PCBs, and metals analysis.*
4. *Background soil samples: 6 samples from each of two locations, NE and NW of Site as shown in Figure 4 of the "HRS Documentation Record", dated February 2002. Collect background using same methods as Site soil samples.*
5. *Soil samples for VOC analysis should be collected with Encore samplers.*
6. *Soil samples from the vacant lot area southwest of the Gulfco property. This area should be divided into grids with maximum grid block dimensions of 100 feet by 100 feet. Samples should be collected from one randomly selected location within each grid block. The samples should be collected from a depth of 0" to 1" bgs with sample analysis for SVOCs, pesticides, PCBs, and metals.*
7. *Three representative soil samples collected from the Site north of Marlin Avenue, and three representative soil samples collected from the Site south of Marlin Avenue, should be analyzed for bulk density, porosity and pH.*
8. *Should a grid location at the perimeter of the Site exceed the screening criteria, then a minimum of two additional grids with maximum dimensions of 200 feet should be created outside of the exceeding grid, and these new grid areas should be sampled at one random location within each grid and analyzed in the same fashion as the soil samples in this task.*

Response: The shallow soil investigation (Task 4), as described in Paragraph 19, has been revised to address these comments. The 20 biased soil sample locations are shown on Figure 3,

as are proposed sampling grids north of Marlin Avenue, south of Marlin Avenue, and on the vacant lot southwest of the Site. In our June 8 meeting, we proposed that samples for VOC analyses be collected from the 12 to 24 inch depth interval at each location and samples for all other analyses be composited from the 0 to 6 inch and 12 to 24 inch depth intervals. You indicated in the meeting that you would consider this alternative approach and review it with EPA's risk assessment personnel. In a June 15 telephone conversation, you indicated that the risk assessors did not support the alternative approach and that analyses of samples from both the 0 to 6 inch and 12 to 24 inch depth intervals would be required for all analytes except VOCs (VOC analyses will be performed on the 12 to 24 inch depth interval samples). We respectfully request that you reconsider our proposal. As reported to us by the Site owner and also mentioned by you in our June 8 meeting, considerable reworking and mixing of shallow soils has occurred over much of the Site in conjunction with and subsequent to Site operations. In light of these soil mixing activities and the inherent averaging of surface soil (the 0 to 2 feet depth interval) data in a risk assessment, we believe our proposed approach appropriately fills the shallow soil data gap identified in the conceptual site model and provides the information necessary to characterize the nature and extent of contamination in this media at the Site. Furthermore, the analysis of a composite sample consisting of multiple sub-samples within the 0 to 6 inch and 12 to 24 inch depth ranges will provide a more representative indication of overall COC concentrations within the surface (0 to 2 foot) depth interval for the purpose of a risk assessment, than discrete samples from the 0 to 6 inch and 12 to 24 inch depth intervals.

As discussed in our June 8 meeting, samples from the vacant lot southwest of the Site will be analyzed for those chemicals of concern (COCs) that exceed residential-based soil screening criteria (and background) in the on-site soil samples. Field analytical methods may be used in lieu of laboratory analyses for the grid-based sample locations, provided that the field method used satisfies all Demonstration of Method Applicability (DMA) requirements as approved by EPA, and at least 10% of the total number of samples analyzed for that COC are analyzed using laboratory methods.

As discussed on May 17, the background soil sampling program is an optional activity to be performed after the biased and grid-based soil sampling results are obtained. Also as discussed, the samples for VOCs will be collected in accordance with Method 5035 procedures, which include the Encore sampler as one of several sampling options.

EPA Comment J: Ground Water Samples:

1. *Maximum 200 ft grid spacing;*
2. *Samples should be collected from one randomly selected location within each grid block.*
3. *Perform shallow sampling in area of impoundments to define potential DNAPL area; then perform deeper sampling as necessary to define vertical extent outside of any DNAPL area to avoid dragging down DNAPL.*
4. *The samples should be collected within the upper ten feet of the uppermost aquifer. The sample analysis should include VOCs, SVOCs, pesticides, PCBs, metals, and TPH.*

5. *These ground water samples may be collected using direct push technology.*
6. *An additional 8 soil borings (in addition to the 7 borings for the monitoring wells) should be drilled 75 to 100 feet outside of the edge of the former impoundments. Additional borings should be drilled as necessary to define the vertical and horizontal extent of any DNAPL zones. Direct push technology may be used as an alternative to borings for defining the DNAPL zones.*
7. *Should any ground water sample location at the perimeter of the Site exceed the screening criteria, then a minimum of two additional ground water samples should be collected outside of the location exceeding the screening levels in the same water bearing zone. These additional ground water samples should be collected and analyzed in the same fashion as the ground water samples in this task. In addition, a minimum of three locations should be sampled for ground water from the water bearing zone located immediately below the water bearing zone that exceeded the screening levels, unless this sampling would result in the penetration of a DNAPL zone. In that case, the DNAPL zone should be defined, and the deeper samples collected outside of the DNAPL zone. This collection of additional samples should be repeated, both vertically and horizontally, until the extent of ground water contamination has been determined.*

Response: The requested provisions, as clarified in our subsequent discussions, have been added to the groundwater investigation (Task 6) described in Paragraph 21. It is anticipated that direct push methods will be used to collect the grid-based groundwater samples and advance the 8 requested soil borings, approximately 75 to 100 feet outside of the surface impoundments. As discussed in our June 8 meeting, DNAPL field screening methods may be used in conjunction with the direct push approach to evaluate the lateral extent of DNAPL should DNAPL be detected at the Site. Use of such field methods will be subject to DMA requirements and EPA approval.

EPA Comment K: Surface Water Samples:

1. *Wetlands north of Site: 15 samples*
2. *Fresh Water Ponds in Lot 55: 6 samples (3 samples in each pond)*
3. *Analyze samples for VOCs, SVOCs, pesticides, PCBs, and metals.*
4. *Metals analysis on both filtered and unfiltered samples.*
5. *Measure hardness and pH on all surface water samples.*

Response: The requested surface water samples and analyses have been added to the SOW through a new task (Task 7) described in Paragraph 22. Proposed surface water sample locations in the pond areas are shown on Figure 5. Fifteen surface water samples will be collected from the wetlands north of Marlin Avenue. These sample locations will be selected at the time of sampling based on potential source areas, Site soils data, observed drainage features and areas within the wetlands where surface water is present.

EPA Comment L: Sediment Samples:

1. *Wetlands north of Site: 15 locations; at each location, one sample at surface of sediment (0" to 6") (15 sediment samples total). The location of the sediment samples should be biased based on the drainage pathways from the Site.*
2. *Barge slips and Intracoastal Waterway: 16 locations - at each location, one sample at surface of sediment (16 sediment samples total).*
 - (a) 5 locations in Barge Slip No. 1;*
 - (b) 5 locations in Barge Slip No. 2; and*
 - (c) 6 locations in the Intracoastal Canal next to the Site.*
3. *Fresh Water Ponds in Lot 55: 8 sediment sample locations (5 locations in the large, pond and 3 in the small pond). At each sampling location, sediment samples should be collected from the same depth as above (8 sediment samples total).*
4. *Analyze sediment samples for VOCs, SVOCs, pesticides, PCBs, metals, and TPH.*
5. *Grain size and total organic carbon (TOC) should be measured on all sediment samples.*
6. *Should any sediment sample location at the perimeter of the sampled wetland area exceed the screening criteria, then a minimum of two additional sediment samples should be collected within 200 feet of the location exceeding the screening levels. This collection of additional sediment samples should be repeated until the extent of sediment contamination has been determined.*

Response: The requested sediment samples and analyses have been added to the sediment sampling task (Task 8) described in Paragraph 23. Proposed sediment sample locations in the pond areas are shown on Figure 5. Fifteen sediment samples will be collected from the wetlands north of Marlin Avenue. These sample locations will be selected at the time of sampling based on potential source areas, Site soils data and observed drainage features.

EPA Comment M: Sediment Toxicity:

1. *Sediment toxicity tests should be run at a total of 12 locations as follows:*
 - (a) 3 in Barge Slip 1*
 - (b) 3 in Barge Slip 2*
 - (c) 2 in the Intracoastal Canal adjacent to the Site*
 - (d) 2 background locations in the Intracoastal Waterway - 1 location northeast of the Site and the other southwest of the Site*
 - (e) 3 locations in the wetlands adjacent to the Site*
 - (f) 1 location in the wetlands 500 feet northwest from the Site, and*
 - (g) 1 location in the wetlands 1000 feet northwest from the Site.*
2. *The location of the sediment toxicity test samples in the wetlands should be biased based on the drainage pathways from the Site.*

Response: The requested activities would be performed as contingent activity based on the evaluation of sediment data collected as part of this investigation relative to ecological screening criteria as indicated in Paragraph 23.g. Specifically, a Screening Level Ecological Risk Assessment (SLERA) Report will be prepared as part of Task 11 (Paragraph 28) should any COC concentrations exceed ecological screening criteria on a statistical basis or should any bioaccumulative COCs be detected above background. This report will be based on "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas" (TCEQ RG-263, December, 2001) and will provide the basis for whether further evaluation, such as sediment toxicity sampling, biological tissue sampling or other studies would be needed. This stepwise approach is consistent with EPA guidance for ecological risk assessment ("ECO Update -Using Toxicity Tests in Ecological Risk Assessment." Office of Solid Waste and Emergency Response. Publication 9345.0-051. March, 1994; "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments - Interim Final." Solid Waste and Emergency Response. OSWER 9285.7-25. EPA 540-R-97-006. June, 1997; and "Guidelines for Ecological Risk Assessment." EPA/630/R-95/002F. April, 1998) and is more technically sound than developing a sediment toxicity program before the initial sediment data that would form the basis for such a program are even collected.

EPA Comment N: Fish/Crab Samples (Human Health):

1. *Intracoastal Canal adjacent to Site: 6 samples (filets) from each of 3 edible fish species (9 total), 6 crab samples from one crab species, fish and crab to be larger than legal possession size.*
2. *Background: 3 fish samples (filet) from each of 3 fish species (9 total), 3 crab samples from one crab species, fish and crab to be larger than legal possession size. Background samples collected from 0.75 miles NE of Site.*
3. *Analyze for SVOCs, pesticides, PCBs, and metals (no VOC analysis).*

Response: The requested activities are proposed as a contingent activity in the attached SOW. Specifically, Paragraph 23.h. requires that ^{Fish}Sed PCLs be developed in accordance with applicable TCEQ and EPA guidance for all sediment bioaccumulative COCs detected above background concentrations in sediment samples collected from the barge slips or Intracoastal Waterway. This paragraph also requires that a Fish/Crab Sampling Work Plan be developed for EPA review and approval for all COCs that exceed ^{Fish}Sed PCLs on a statistical basis. This stepwise approach is consistent with TCEQ procedures ("Determining PCLs for Surface Water and Sediment." TCEQ RG-366/TRRP-24. May 2002) and, in our opinion is technically superior to the requested program because the stepwise approach uses the sediment data collected in Task 8 to identify those COCs associated with the Site that would serve to differentiate Site impacts on fish tissue concentrations relative to other potential sources, thus more clearly defining the data quality objectives of the fish tissue sampling program.

EPA Comment O: Biological Tissue Testing (Ecological):

1. *Biological testing should be conducted for the ecological risk assessment as follows:*
 - (a) *Collect 10 composite samples of fiddler crabs located in the wetlands northwest of the Site; and*

- (b) *Collect 4 composite foraging fish ("fundulus") samples - 2 from each barge slip, and perform whole body analysis.*

2. *Biological samples should be analyzed for SVOCs, pesticides, PCBs, and metals.*

Response: The requested activities would be performed as contingent activity based on the evaluation of sediment data collected as part of this investigation relative to ecological screening criteria as indicated in Paragraph 23.g. The SLERA Report described above will provide the basis for whether further evaluation, such as sediment toxicity sampling, biological tissue sampling or other studies would be needed. Again, this stepwise approach is consistent with the technical guidance for ecological risk assessment cited above and is more technically sound than developing a biological tissue testing program before the sediment data that form the basis of the program and the development of data quality objectives are even collected. A biological tissue testing program alone cannot differentiate the impact of the Site compared to other potential sources without first obtaining the sediment data to be collected as part of Task 8.

EPA Comment P-1: *Number of samples is based on environmental sampling only. Additional samples will be required for the QA/QC requirements (i.e., field blanks, trip blanks, duplicates, MS/MSD, etc.).*

Response: Comment acknowledged. A detailed discussion of numbers and types of QA/QC samples will be provided in the QAPP to be submitted under Task 2 (Paragraph 17).

EPA Comment P-2: *The Respondents should provide for a lab audit of the laboratory(s) to be used unless the lab is NELAC certified.*

Response: This provision has been added to the QAPP requirements in Paragraph 17.

EPA Comment P-3: *The purpose should be to evaluate the lateral and vertical extent of potential DNAPL and COCs in groundwater.*

Response: This correction has been made to Paragraph 21.

EPA Comment P-4: *Number of samples is for the initial sampling phase. Additional sampling may be required if initial sampling is not sufficient to define horizontal and vertical extent of contamination, or to better define "hot spots", or to fill in any data gaps.*

Response: Comment acknowledged. The provision for additional sampling is included in Tasks 4, 6, 7 and 8 and is noted in Table 1.

EPA Comment P-5: *Vertical/horizontal extent based on following benchmarks:*

(a) *Soil:*

(i) *North of Marlin Ave.: EPA Ecological Soil Screening Levels; or, if not available, then TCEQ Ecological Benchmarks for Soil, Table 3-4.*

(ii) *South of Marlin Ave.: EPA Region 6 Soil Screening Levels for commercial/industrial human health exposure.*

(iii) *No deeper than the water table.*

(b) *Ground Water: TCEQ Ecological Benchmarks for Water, Table 3-2; ground water PRGs based on ecological receptors because of potential for migration to surface water.*

- (c) *Sediment: TCEQ Ecological Benchmarks for Sediment, Table 3-3.*
- (d) *Surface Water: TCEQ Water Quality Standards, or, if not available, then Ecological Benchmarks for Water, Table 3-2.*

Response: These screening criteria, as well as other screening criteria discussed in our May 17 and June 8 meetings, have been specifically identified in Tasks 4, 6, 7 and 8.

EPA Comment P-6: *To evaluate groundwater flow rate and direction Site, in addition to using water level data to construct potentiometric surface maps for the Site, a staff gauge should be placed in the surface water in the wetlands to the northwest of the Site in addition to one installed at the Intracoastal Waterway shoreline (to allow comparison of groundwater elevations to surface water levels).*

Response: Placement and monitoring of a staff gauge in the surface water in the wetlands to the northwest of the Site has been included in Paragraph 21.1.

EPA Comment P-7: *Table 1 - Sample Analysis Summary, does not provide for sufficient quality control samples. The quality control sampling frequency shown in the table below should be used.*

<i>Media</i>	<i>Field Duplicate</i>	<i>Equipment Rinsate Blank</i>	<i>Trip Blank</i>	<i>Field Blank</i>	<i>Matrix Spike/Matrix Spike Duplicate</i>	<i>Proficiency Test Sample (NITCI Standard or equivalent)</i>
<i>Aqueous</i>	<i>1 in 20</i>	<i>1 in 20 or one per day</i>	<i>One per sample shipment (VOCs only)</i>	<i>One per day</i>	<i>1 in 20</i>	<i>One per shipment</i>
<i>Soil & Sediment</i>	<i>1 in 20</i>	<i>1 in 20 or one per day</i>	<i>Not required</i>	<i>Not required</i>	<i>1 in 20</i>	<i>One per shipment</i>
<i>Tissue</i>	<i>Not required</i>	<i>1 in 20 or one per day</i>	<i>Not required</i>	<i>Not required</i>	<i>Not required</i>	<i>Not required</i>

Response: The requested quality control sample frequency will be specified in the QAPP to be prepared under Task 2 (see Paragraph 17.f).

EPA Comment P-8: *The Remedial Action Plan (RAP) should be provided to the community for review and comment (not only if requested). A responsiveness summary should be provided for the public comments.*

Response: The requested provisions have been added to Task 13 (Paragraph 31).

EPA Comments P.9 through P.12: *There should be monthly mailings of fact sheets, not only one. Each fact sheet should be submitted for regulatory review and approval. The community should*

be kept informed through public/community meetings. The meetings should be held, at a minimum, before the investigation starts, at the completion of the investigation, for the proposed cleanup plan, and following completion of the cleanup. The Respondents should make sufficient funding available to the community for them to hire their own technical advisor. The Respondents describe community involvement activities that are contingent upon requests from the community. The Respondents should be proactive in communicating with the community with a Community Involvement Plan (CIP) that will specify the activities to be completed.

Response: As provided in Task 10 (Paragraph 26), the requested information will be described in the CIP to be submitted to EPA for review and approval (with a copy to TCEQ) within sixty (60) calendar days after the effective date of this AOC. The format and contents of the CIP will be based on the *Superfund Community Involvement Handbook* and the Community Relations Plan for the Tex Tin Superfund Site provided by EPA in our May 17 meeting. An outline of the CIP components is provided in Paragraph 26.

EPA Comment P-13: *Commercial/industrial cleanup levels will require institutional controls if remediation will not result in unrestricted use and access. Any institutional controls should be fully described in the RAP.*

Response: Comment acknowledged. The requested provision is a required RAP element under the Texas Risk Reduction Program (TRRP).

EPA Comment P-14: *All laboratory analysis results, reports, and supporting information should be provided to EPA (and TCEQ?) at the same time that this information is provided to the Respondents.*

Response: The requested provision has been added to Paragraph 14.

EPA Comment P-15: *These comments are in addition to the provisions in the SOWs.*

Response: Comment acknowledged.

EPA Comment P-16: *EPA and/or TCEQ may have additional comments on the work plans.*

Response: Comment acknowledged. Provisions for work plan review and comment are provided in the SOW.

Verbal EPA Comment Provided in May 17 Meeting: *Sediment samples should be collected at four locations in the canals within the Bridge Harbor community southwest of the Site.*

Response: The requested activity would be performed as a contingent activity in the attached SOW. Specifically, Paragraph 23.f requires that should any sediment sample location at the perimeter of the sampled area exceed the screening criteria, then a minimum of two additional sediment samples will be collected within 200 feet of the location exceeding the screening levels. This collection of additional sediment samples will be repeated until the extent of sediment contamination has been determined.

Thank you for the opportunity to submit this revised SOW. Should you have any questions, do not hesitate to call me.

Sincerely,

PASTOR, BEHLING & WHEELER, LLC

A handwritten signature in black ink, appearing to read 'Eric F. Pastor', with a stylized, flowing script.

Eric F. Pastor, P.E.
Principal Engineer

Attachments

cc: Mr. Jay Carsten – Texas Commission on Environmental Quality
Mr. Brent Murray - Sequa Corporation
Mr. Scott Magelssen - The Dow Chemical Company
Ms. Sandi VanWormer - The Dow Chemical Company
Ms. Jeannine Sohayda – The Dow Chemical Company
Mr. Allen Daniels - LDL Coastal Limited, LP
Mr. F. William Mahley - Strasburger & Price, LLP
Mr. James C. Morris III - Thompson & Knight, LLP
Ms. Elizabeth Webb - Thompson & Knight, LLP

**DRAFT SCOPE OF WORK
SITE INVESTIGATION AND REMOVAL ACTION**

**GULFCO MARINE MAINTENANCE SUPERFUND SITE
FREEPORT, BRAZORIA COUNTY, TEXAS**

I. INTRODUCTION

1. This Scope of Work (SOW) describes site investigation (SI) and any necessary removal action (RA) activities that will be carried out by Respondents for the Gulfco Marine Maintenance Superfund Site (Site). This SOW is attached to the Administrative Order on Consent (AOC) for the Site and is a supporting document for the AOC. Technical work described in the SOW is intended to provide more information to Respondents for purposes of implementing the AOC and is not intended to change the meaning of any AOC language. This SOW is also consistent with both the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP). Any discrepancies between the AOC and SOW are unintended, and whenever necessary, the AOC will control in any interpretive disputes.
2. The purpose of the site investigation activities is to investigate the nature and extent of contamination for the Site, to assess the potential risk to human health and the environment, and to develop and evaluate potential removal action alternatives. The purpose of any removal action activities is to address those media and/or potential exposure routes that pose an unacceptable risk to human and/or ecological receptors.
3. Respondents will conduct the SI activities and will produce a draft Affected Property Assessment Report (APAR) and Response Action Plan (RAP) that are in accordance with the AOC. The APAR and RAP will be consistent with EPA, Texas Risk Reduction Program (TRRP), and Texas Commission on Environmental Quality (TCEQ) Voluntary Cleanup Program (VCP) guidance, as applicable and appropriate.

Purpose of the Scope of Work

4. This SOW sets forth certain requirements of the AOC for implementation of the Work pertaining to SI activities to be undertaken by Respondents at the Site.

Objectives of the Site Investigation

5. The objectives of the SI are to investigate the nature and extent of contamination at the Site, gather the information necessary to prepare an Affected Property Assessment Report (APAR) and to develop and evaluate potential removal action alternatives, consistent with the Texas Voluntary Cleanup Program (30 TAC Chapter 333, Subchapter A), the Texas Risk Reduction Program (30 TAC Chapter 350), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, 42 U.S.C. § 9601, et seq.), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan). Specifically, these objectives are to determine the presence or absence, types, and quantities (concentrations) of contaminants; mechanism of contaminant release to pathway(s); direction of pathway(s) transport; boundaries of source(s) and pathway(s); and environmental/public health

receptors as needed to evaluate indeterminate or complete and potentially significant pathways indicated in the Conceptual Site Model in Figure 1.

Description of the Site

6. The Gulco Site is located at 906 Marlin Avenue, Freeport, Brazoria County, TX. The property consists of Lots 21 through 25 and Lots 55 through 58, Subdivision 8, of the Brazos Coast Investment Company (Figure 2). Marlin Avenue separates Lots 55 through 58 on the north from Lots 21 through 25 on the south. Lots 21 through 25 are approximately four-acre tracts bordered on the south by the Intracoastal Waterway. Lots 55 through 58 are approximately five-acre tracts. The entire property is about 40 acres in size.
7. The Site was a former barge cleaning and servicing facility that operated from 1971 through 1998. Barges brought to the facility were cleaned of waste oils, caustics, and organic chemicals, and the wash waters generated during these operations were stored in three surface impoundments, or earthen pits, with natural clay liners. Located on Lot 56 on the north side of Marlin Avenue, the three surface impoundments covered a total area of about 2.3 acres. With state approval, these impoundments were closed in August 1982 by partially removing the sludges, filling the impoundments with clay, and then covering them with gravel or crushed shells. Approximately 100 cubic yards of sludge were left in the surface impoundments following closure, primarily in surface impoundment No. 2. After 1981, waste wash waters were stored in a rented floating barge or aboveground storage tanks located at the Site. The dry dock area associated with Barge Slip 1 permitted a barge to be completely removed from the water for necessary repairs on the barge hull bottom or to sandblast and repaint the entire hull.
8. Soil sampling activities performed at the Site by the Texas Natural Resource Conservation Commission (TNRCC) (now known as the Texas Commission on Environmental Quality or TCEQ) in January 2000 indicated one or more hazardous substances above background concentrations or above the sample quantitation limit (for substances not detected in site-specific background samples) in soil samples from the Site. These samples were collected near two former sandblast areas, near a former drum storage area, near a former wash water storage area, near the former impoundments, and near a driveway area on Lot 57. However, in many cases, these reported detections were qualified as estimated concentrations because one or more quality control criteria had not been met.
9. Groundwater sampling activities performed at the Site by the TNRCC in January 2001 indicated hazardous substances above background concentrations or above the sample quantitation limit (for substances not detected in site-specific background samples) in ground water samples collected from temporary monitoring wells in the immediate vicinity of the former impoundments. However, in many cases, these reported detections were qualified as estimated concentrations because one or more quality control criteria had not been met.
10. Sediment sampling activities performed in Site barge slips and areas adjacent to the Site by TNRCC in January 2000 detected one or more hazardous substances above background concentrations or above the sample quantitation limit (for substances not detected in site-specific background samples). However, in some cases, these reported

detections were qualified as estimated concentrations because one or more quality control criteria had not been met.

11. The Site was proposed for listing on the National Priorities List ("NPL") on September 5, 2002 (67 FR 56794), and was placed on the NPL effective May 30, 2003, in a final rulemaking published on April 30, 2003 (68 FR 23077).

II. TASKS TO BE PERFORMED AND DELIVERABLES

Application to Texas Commission on Environmental Quality Voluntary Cleanup Program

12. No later than thirty (30) calendar days after the effective date of the AOC, Respondents shall submit an application to the TCEQ for entry in the Voluntary Cleanup Program (VCP). Respondents shall pay all VCP application fees to TCEQ and provide all necessary information required by TCEQ to facilitate approval of the VCP application and shall execute a VCP agreement upon application approval.

Conduct of the Site Investigation

13. This SOW specifies the Work to be performed and the deliverables to be produced by the Respondents. The Respondents shall conduct SI activities in accordance with this SOW, the AOC, and all applicable EPA, TRRP and TCEQ VCP guidance, as well as any additional requirements in the AOC. The Respondents shall furnish all personnel, materials, and services necessary for, and incidental to, performance of the investigation activities, except as otherwise specified in the AOC or SOW. All data necessary for calculations of contaminant fate and transport will be collected as part of site investigation procedures.

Submittal of Deliverables

14. All draft and final deliverables specified in this SOW shall be provided in hard copy, by the Respondents, to the TCEQ (two copies) and EPA (one copy). Final deliverables shall also be provided in hard copy and electronic format (specifically, Adobe® PDF format) to the Information Repository established for the Site. Additionally, all deliverables specified in this SOW shall be submitted by the Respondents according to the requirements of this SOW and Appendix A (Schedule of Deliverables). All final laboratory analysis results, reports, and supporting information will be provided to EPA at the same time that this information is provided to Respondents.

Tasks to be Performed by the Respondents

15. The Respondents shall perform each of the following Tasks (Tasks 1-11) as specified in this SOW.

Task 1 – Investigation Site Health and Safety Plan

16. The Respondents shall prepare an investigation Site Health and Safety Plan (HSP) within thirty (30) calendar days after the effective date of this AOC. This HSP must be in compliance with Occupational Safety and Health Administration and EPA requirements, and must be in place prior to any onsite investigation activities.

Task 2 – Quality Assurance Project Plan

17. The Respondents shall prepare and submit a Quality Assurance Project Plan (QAPP) to EPA for review and approval, with a copy to TCEQ within sixty (60) calendar days after the effective date of this AOC. This plan shall include the following:
 - a. Sampling procedures, sample custody, analytical procedures, data reduction, data validation, data reporting, personnel qualifications, maximum holding times, and types and amounts of preservatives.
 - b. A demonstration that each analytical laboratory that may be used is qualified to conduct the proposed work. This includes use of methods and analytical protocols for the chemicals of concern in the media of interest within detection and quantification limits consistent with both QA/QC procedures and the DQOs presented in the QAPP. The laboratory will have, and follow, an approved QA program. If a laboratory not in the Contract Laboratory Program (CLP) program is selected, a laboratory QA program will be included in the QAPP.
 - c. Sampling equipment decontamination procedures.
 - d. A list of analytes for all methods. For EPA Methods SW-846 8260, 8270, 6010, 7470, 7471, 8081, and 8082 the analyte list will include all analytes covered by each method. Alternative analysis methods may be required to achieve the necessary detection limits listed below:
 - (1) Surface water and ground water: Analytical methods with detection limits for all analytes as specified in the Ecological Benchmarks for Water, Table 3-2: "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas"; December 2001; RG-263 (revised), including any updates.
 - (2) Sediment: Analytical methods with detection limits for all analytes as specified in the Ecological Benchmarks for Sediment, Table 3-3: "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas" including any updates.
 - (3) Soil north of Marlin Ave.: Analytical methods with detection limits for all analytes as specified in the EPA Ecological Soil Screening Levels; or Ecological Benchmarks for Soil, Table 3-4: "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas", including any updates, for analytes not included in EPA's Ecological Soil Screening Levels.

(4) Soil south of Marlin Ave.: EPA Region 6 Soil Screening Levels for commercial/industrial human health exposure.

- e. A requirement that Respondents provide for a lab audit of the laboratory(s) to be used unless the lab is NELAC certified.
- f. The types, collection procedures and frequency of quality control samples.

Task 3 – Former Impoundment Cap Evaluation

18. The purpose of this task is to assess the construction materials and thickness of the caps constructed on the former impoundments in order to evaluate the potential for transport of volatile organic compounds (VOCs) in any residual waste materials through the cap/cover material to outdoor air (Potential Exposure Route A on Figure 1). The following activities shall be performed by Respondents as part of Task 3:
- a. Advance four soil borings at the locations shown on Figure 2. Borings will be drilled and continuously sampled to a depth of five (5) feet or to the base of the cap material, whichever occurs first.
 - b. Collect one representative soil sample from each boring for laboratory geotechnical analyses (Percent Passing No. 200 Sieve, Atterburg Limits, and vertical hydraulic conductivity) as indicated on Table 1.
 - c. Perform a field inspection of the caps, including observation of desiccation cracks, erosion features and overall surface condition.
 - d. Using cap geotechnical properties and field inspection observations, qualitatively evaluate the caps integrity and the potential for organic vapor transport through the caps.

Task 4 – Shallow Soil Investigation

19. The purpose of this task is to evaluate the lateral extent of potential chemicals of concern (COCs) in shallow soils (and residual sand blast grit material in soil) in order to evaluate potential human health and ecological risks associated with direct contact with and ingestion of soil (Potential Exposure Route PP), or potential runoff from these areas to surface water (Potential Exposure Routes MM and NN). This task is also intended to provide information for identifying the potential waste classification of residual sand blast grit material at the Site. The following activities shall be performed by Respondents as part of Task 4:
- a. Collect shallow soil samples from the twenty (20) sample locations shown on Figure 3. These judgment-based sample locations were selected based on exceedences of preliminary screening criteria and/or association with potential source areas, such as the former aboveground storage tank (AST), sand blast, or former impoundment areas. As such, data from these locations will present a conservative indication of potential COC concentrations in shallow soils. In addition, grid-based samples will be collected on a 200 ft. grid spacing north of Marlin Ave and a 100 ft grid spacing south of Marlin Ave with samples collected from one randomly selected location within each grid block. At each sample

location, samples will be collected from the 0 to 6 inch and 12 to 24 inch depth intervals. Samples for non-volatile analyses (i.e., all analyses except VOCs) will be composited in the field from the two sample depth intervals. Samples for VOC analyses will only be collected from the 12 to 24 inch depth interval at each location. Soil samples will also be collected from the vacant lot area southwest of the Site on a 100 ft grid spacing with samples collected from one randomly selected location within each grid block. These samples will be collected from the 0 to 1 inch depth interval.

- b. Collect shallow soil samples using either a hand auger, a plastic or stainless steel trowel, or a split-spoon sampler advanced by a drill rig. Samples for VOCs will be collected in accordance with Method 5035 procedures. Sample lithologies will be described in the field. All sampling equipment will be decontaminated prior to and following each use. Samples will be placed in laboratory-supplied containers, preserved as necessary, placed on ice and delivered to the analytical laboratory.
- c. Analyze soil samples for the parameters indicated in Table 1. Composite samples will be analyzed for semi-volatile organics (SVOCs), total petroleum hydrocarbons (TPH), pesticides, PCBs and metals. Samples from the 12 to 24 inch depth interval will be analyzed for VOCs. Results will be reported on a dry weight basis, so all samples will also be analyzed for moisture content. Samples from the vacant lot southwest of the Site will be analyzed for those chemicals of concern (COCs) that exceed residential-based soil screening criteria (or background) in the on-site soil samples. Field analytical methods may be used in lieu of laboratory analyses for the grid-based sample locations, provided that the field method has satisfied all Demonstration of Method Applicability (DMA) requirements as approved by EPA, and at least 10% of the total number of samples proposed for the field analysis are also analyzed using the laboratory methods identified in Table 1. Three representative soil samples north of Marlin Avenue and three representative soil samples from south of Marlin Avenue (to be selected based on field observations) will be analyzed for bulk density, specific gravity, fraction organic carbon (foc) and pH to support evaluations of contaminant fate and transport.
- d. Assess the usability of soil analytical data in accordance with the applicable guidance as described in the QAPP.
- e. Evaluate soil sample analytical results by comparing data to screening criteria. COC concentrations in soil samples collected north of Marlin Avenue will be compared to the lowest of the following: $^{GW}Soil_{Class3}$ Protective Concentration Levels (PCLs), $^{Tot}Soil_{Comb}$ PCLs, EPA Reg. 6 Soil Screening Criteria (SSC), TCEQ Ecological Benchmarks for soil (provided in Table 3-4 of TCEQ "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas" (TCEQ Eco-risk Guidance) or subsequent TCEQ guidance), and EPA Ecological Soil Screening Levels (SSL). COC concentrations in soil samples collected south of Marlin Avenue will be compared to the lowest of the following: $^{GW}Soil_{Class3}$ PCLs, $^{Tot}Soil_{Comb}$ PCLs, EPA Reg. SSC. Except where indicated otherwise in applicable TCEQ or EPA guidance, these screening criteria will be based on commercial/industrial land use assumptions. These screening criteria comparisons are subject to adjustment based on background

concentrations (i.e., values below background will not be considered exceedences) with background concentrations identified based on previous background samples collected in the site vicinity, background samples collected as part of this investigation (see below), Texas-specific background concentrations identified in 30 TAC 350.51(m), or other appropriate literature background values approved by EPA. Comparisons to ecological benchmarks may be refined based on the findings of a Tier 2 or Tier 3 ecological risk assessment (see Task 11, below).

- f. At the Respondents option (depending on the specific COCs and concentrations detected), background soil sampling may be performed as part of this investigation. If such sampling is performed, six (6) background soil samples will be collected from each of two locations northeast and northwest of the Site as shown in Figure 4 of the "HRS Documentation Record", dated February 2002. Background soil samples will be collected using the same methods as the Site soil samples. The analytical suite for the background samples will be developed by the Respondents following completion of Site soil sampling and analytical activities.
- g. Should a grid location at the perimeter of the Site exceed the screening criteria, then a minimum of two additional grids with maximum dimensions of 200 feet (or 100 feet for samples collected on a 100-ft grid basis) will be created outside of the exceeding grid, and these new grid areas will be sampled at one random location within each grid and analyzed in the same fashion as the soil samples in this task. These samples will be analyzed for those COCs exceeding screening levels in the adjacent samples. Any areas where soil sample data exceed critical PCLs will be identified as PCLE zones in the Affected Property Assessment Report (APAR)(see Task 12).

Task 5 – Water Well Survey

- 20. The purpose of this task is to provide supporting information for evaluating the potential for COC-containing groundwater or dense non-aqueous phase liquid (DNAPL) migration to water supply wells (Potential Exposure Routes L through O). The following activities shall be performed by Respondents as part of Task 5:
 - a. Perform an updated search of Texas Water Development Board (TWDB) and TCEQ records for all registered water wells located within ½-mile radius of the Site boundary. As part of this search, all information related to water well completion, lithology, owner, status, use, and water quality (if available) will be compiled.
 - b. Perform a field survey to confirm/update information obtained during the records search and attempt to identify any unregistered water supply wells located within ½-mile radius of the Site boundary. If any unregistered wells are identified, information related to water well completion, lithology, owner, status, use, and water quality (if available) will be recorded.

Task 6 – Groundwater Investigation

21. The purpose of this task is to evaluate the lateral and vertical extent of potential DNAPL and COCs in groundwater in order to evaluate potential human health and ecological risks associated with: (1) groundwater or DNAPL migration to water supply wells (Potential Exposure Routes L through O); (2) groundwater or DNAPL migration to surface water (Potential Exposure Routes AA through CC); (3) potential volatilization of VOCs from groundwater to ambient air (Potential Exposure Route DD); and potential vapor migration to indoor air in residential areas (Potential Exposure Route EE). The following activities shall be performed by Respondents as part of Task 6:
- a. Install monitoring wells at the seven (7) sample locations shown on Figure 4. These sample locations were selected based on association with potential source areas, such as the former surface impoundments, the former AST tank farm, the former sand blast area, or the former wash water storage tank area. The three locations immediately northwest of the Intracoastal Waterway will also serve to provide an indication of groundwater conditions near likely points of discharge to surface water.
 - b. Drill soil borings for monitoring wells using hollow stem auger methods. Soil samples will be collected continuously from each boring using a split-barrel sampler or core barrel sampler. Soil samples will be logged in the field for lithology and sedimentary structure. Soil headspace samples will be periodically collected and analyzed in the field for total organic vapor concentrations using a photoionization detector (PID) calibrated to an isobutylene standard. Soil core samples will be visually inspected for NAPL presence and field screening using soil/water shake tests, shake tests with hydrophobic dyes and/or UV fluorescence may also be used. Soil borings will be advanced as necessary to identify the top and base of the uppermost water bearing-unit at the Site. Based on the boring logs for previous monitoring wells drilled at the Site, it is anticipated that these borings will be advanced to a maximum depth of 30 feet. In no case will a boring in which field indications of a DNAPL are noted be advanced through an underlying low permeability confining unit.
 - c. Construct a monitoring well within each soil boring as the augers are withdrawn. Monitoring wells will be constructed using 2-inch diameter, flush-joint-threaded Schedule 40 PVC casing and 0.010-inch slotted PVC screen. The specific well design will be determined in the field based on the observed lithology with the goal of screening the well at the base of the uppermost water-bearing unit. It is anticipated that each well screen will be approximately 10 to 15 feet in length and where possible will extend above the observed groundwater table. After a boring is completed to the total depth, the casing and screen will be lowered into the open borehole. Once the casing and screen are in place, the remaining well materials (20/40 filter sand, bentonite pellets, and cement/bentonite grout) will be added to the hole. Depths to the top of the annular materials will be measured with a weighted, calibrated tape and recorded. A bentonite seal layer will be a minimum of 2 feet in thickness. Each well will be completed above grade within a protective steel casing on a 4-foot-by-4-foot concrete pad. After construction, the position and elevation of each monitoring well will be surveyed relative to Texas state plane coordinates and mean sea level.

- d. Develop each monitoring well to remove fine-grained material and fluids affected by the drilling process. Development will be performed by pumping and/or bailing and the well will be surged using the bailer or a surge block. The temperature, specific conductance and pH of the water removed from the well will be periodically measured and recorded on a well development record to document the development process. Well development will continue until these parameters have stabilized. All well development water will be contained on-site pending characterization and management as described in Task 8.
- e. Collect a groundwater sample from each monitoring well. Prior to initiating groundwater sampling, a complete set of water levels (including an evaluation of the possible presence of NAPL using an interface probe, conductivity probe and bailer) will be measured in all wells. In the event that NAPL is observed, an attempt will be made to collect a NAPL sample for possible future analysis. Groundwater samples will be collected using a peristaltic or bladder pump in accordance with low-flow sampling procedures. Wells will be pumped at a rate of approximately 0.1 liters per minute during purging and sampling. Electrical conductivity, pH, temperature, dissolved oxygen and turbidity will be measured and recorded during well purging. These parameters will be allowed to stabilize prior to collecting the groundwater sample. Samples will be collected in laboratory-supplied containers, preserved as necessary, placed on ice and delivered to the analytical laboratory. It is anticipated that each monitoring well will be sampled at least twice prior to APAR submittal (Task 12 below). All purge water will be contained on-site pending characterization and management as described in Task 8.
- f. Analyze groundwater samples for VOCs, SVOCs, metals, pesticides, PCBs and TPH, as indicated in Table 1. One groundwater sample north of Marlin Avenue and one groundwater sample south of Marlin Avenue will also be analyzed for total dissolved solids, major anions and major cations.
- g. Perform the following actions, if the presence of DNAPL is identified in any of the seven monitoring wells:
 - i. Attempt to collect a sample of the DNAPL from each well in which it is observed. DNAPL samples will be analyzed for specific gravity, VOCs, SVOCs and pesticides.
 - ii. Define the lateral extent of DNAPL in the affected water-bearing unit. A combination of direct push methods, auger drilled soil borings, and/or monitoring wells may be used in this effort. The lateral extent of DNAPL will be defined by the absence of any field screening indications in a boring or direct push location, or the absence of detectable DNAPL in a well. Any DNAPL field screening techniques will be subject to DMA requirements and EPA approval. If DNAPL is identified in the vicinity of the surface impoundments, auger drilled or direct push borings will be advanced at the locations shown on Figure 4 (subject to equipment accessibility).
 - iii. Define the vertical extent of DNAPL, by advancing deeper borings (using direct push or auger methods) or installing deeper monitoring wells outside the perimeter of the identified DNAPL zone to the base of the next underlying water-bearing unit, or within the DNAPL zone if a surface isolation casing used and a competent underlying confining unit

is identified. The vertical extent of DNAPL will be defined by the absence of any field screening indications in a boring or direct push location, or the absence of detectable DNAPL in a well.

- h. Following monitoring well installation and sampling and DNAPL delineation, collect grid-based samples on a 200 ft. grid spacing with samples collected from one randomly selected location within each grid block (monitoring wells located within a grid block can be used as the representative sample from within that grid block). The samples will be collected within the upper ten feet of the uppermost aquifer and may be collected using direct push technology. The sample analysis will include VOCs, SVOCs, pesticides, PCBs, metals, and TPH. Field analytical methods may be used in lieu of laboratory analyses for the grid-based sample locations, provided that the field method has satisfied all Demonstration of Method Applicability (DMA) requirements as approved by EPA, and at least 10% of the total number of samples proposed for the field analysis are also analyzed using the laboratory methods identified in Table 1.
- i. Evaluate the subsurface stratigraphy from the ground surface to the top of the uppermost water supply aquifer. This evaluation may be accomplished through: (1) geophysical profiling of former water supply wells located on the Site or on the vacant lot southwest of the Site; (2) advancement of a soil or CPT boring; or (3) examination of driller's logs for local water wells or available literature information (subject to EPA review and approval).
- j. Assess the usability of all groundwater analytical data in accordance with the applicable guidance as described in the QAPP.
- k. Perform hydraulic testing on up to three monitoring wells. Wells for hydraulic testing will be selected based on lithologic data, water level measurements and drawdown/recharge behavior during development and sampling, with the goal of selecting wells that represent the range of hydraulic conditions in the uppermost water-bearing unit at the Site. Slug-out tests will be performed at each of these wells using a PVC or stainless steel slug. Slug test water level data will be measured manually or using a pressure transducer. Data will be analyzed using a method appropriate for the water-bearing unit characteristics (i.e., confined or unconfined).
- l. Evaluate groundwater flow rate and direction. Site water level data will be used to construct potentiometric surface maps for the Site. These maps along with the hydraulic testing data will be used to project groundwater flow rates and directions. Staff gauges will be installed at the Intracoastal Waterway shoreline and within the wetlands north of the Site. These staff gauges will be surveyed relative to allow comparison of groundwater elevations to waterway levels.
- m. Evaluate groundwater sample analytical results by comparing data to screening criteria. Groundwater concentrations will be compared to the lowest of the following: $^{GW}GW_{Class3}$ PCL, $^{Air}GW_{Inh-V}$ PCL, and TCEQ Ecological Benchmarks for water provided in Table 3-2 of TCEQ "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas" (TCEQ Eco-risk Guidance) or subsequent TCEQ guidance. Except where indicated otherwise in applicable TCEQ or EPA guidance, these screening criteria will be based on

commercial/industrial land use assumptions. These screening criteria comparisons are subject to adjustment based on background concentrations (i.e., values below background will not be considered exceedences) with background concentrations identified based on previous background samples collected in the site vicinity, background samples collected as part of this investigation, or other appropriate literature background values approved by EPA. Comparisons to ecological benchmarks may be refined based on the findings of a Tier 2 or Tier 3 ecological risk assessment (see Task 11, below).

- n. Should any ground water sample location at the perimeter of the Site exceed the screening criteria, then a minimum of two additional ground water samples will be collected outside of the location exceeding the screening levels in the same water-bearing zone. These additional ground water samples will be collected and analyzed in the same fashion as the ground water samples in this task. In addition, a minimum of three locations will be sampled for ground water from the water-bearing zone located immediately below the water-bearing zone that exceeded the screening levels, unless this sampling would result in the penetration of a DNAPL zone. In that case, the DNAPL zone will be defined, and the deeper samples collected outside of the DNAPL zone. This collection of additional samples will be repeated, both vertically and horizontally, until the extent of ground water contamination has been determined. The contingent groundwater samples will be analyzed for those COCs exceeding screening levels in the adjacent (or overlying, in the case of vertical delineation) samples. Any areas where groundwater sample data exceed critical PCLs will be identified as PCLE zones in the APAR.
- o. Evaluate the possible use of previously existing monitoring wells MW-1, MW-2, MW-3, HMW-1, HMW-2, HMW-3, LGW-8, and LGW-9 for water-level measurement and potentiometric surface assessment purposes. Wells that are deemed unusable for these purposes may be plugged and abandoned in accordance with Texas water well driller regulations.

Task 7 – Surface Water Investigation

- 22. The purpose of this task is to evaluate the lateral extent of potential COCs in surface water in the wetlands north of Marlin Avenue and in ponds on the Site in order to evaluate potential human health and ecological risks associated with direct contact with and/or ingestion of surface water by human or ecological receptors (Potential Exposure Route MM). The following activities shall be performed by Respondents as part of Task 7:
 - a. Collect surface water samples from 15 locations within the wetlands north of Marlin Avenue. These sample locations will be determined in the field based on potential source areas, Site soils data and drainage features. In addition three surface water samples will be collected from each of the two ponds on or adjacent to Lot 55 (see Figure 5).
 - b. Collect surface water samples using a bailer, dip sampler or other discrete depth sampling equipment from the water surface. Filtered and unfiltered samples will be collected for metals analyses. Field pH will be measured at the time of sample

collection. Samples will be placed in laboratory-supplied containers, preserved as necessary, placed on ice and delivered to the analytical laboratory.

- c. Analyze surface water samples for VOCs, SVOCs, metals, pesticides, PCBs, and hardness, as indicated in Table 1.
- d. Assess the usability of surface water analytical data in accordance with the applicable guidance as described in the QAPP.
- e. Evaluate surface water analytical results by comparing data to screening criteria. COC concentrations in surface water samples will be compared to the lowest of the following: $TotSW_{Comb}$ PCL, and TCEQ Ecological Benchmarks for water provided in Table 3-2 of TCEQ Eco-risk Guidance or subsequent TCEQ guidance. These screening criteria comparisons are subject to adjustment based on background concentrations (i.e., values below background would not be considered exceedences) with background concentrations identified based on previous background samples collected in the site vicinity, background samples collected as part of this investigation, or other appropriate literature background values approved by EPA. Comparisons to ecological benchmarks may be refined based on the findings of a Tier 2 or Tier 3 ecological risk assessment (see Task 11, below).
- f. Should any surface water sample location at the perimeter of the wetland area exceed the screening criteria, then a minimum of two additional surface water samples will be collected within 200 feet of the location exceeding the screening levels. This collection of additional surface water samples will be repeated until the extent of surface water contamination has been determined. These samples will be analyzed for those COCs exceeding screening levels in the adjacent samples.

Task 8 – Sediment Investigation

- 23. The purpose of this task is to evaluate the lateral extent of potential COCs in sediments in order to evaluate potential human health and ecological risks associated with: (1) uptake of COCs from sediments by ecological receptors and subsequent ingestion (Potential Exposure Route JJ); and (2) direct contact with and/or ingestion of sediments (Potential Exposure Route OO). The following activities shall be performed by Respondents as part of Task8:
 - a. Collect sediment samples from 15 locations within the wetlands north of Marlin Avenue. These sample locations will be determined in the field based on potential source areas, Site soils data and drainage features. In addition, sediment samples will be collected from the barge slips, Intracoastal Waterway and two ponds on or adjacent to Lot 55 as shown on Figure 6.
 - b. Collect sediment core samples from the barge slips and Intracoastal Waterway using a boat-mounted piston-coring device fitted with removable polycarbonate or stainless steel sample tubes, or similar sampling system. When the desired sediment core depth is reached, the coring device is manually raised to the sampling platform. The piston acts as a plug to prevent the sediment core from backing out of the core tube while the device is being raised. Once it reaches the

sampling platform, the bottom of the core tube is plugged and the core head and piston are removed from the core tube. The sediment core is then extruded and sub-samples collected at selected depth intervals. Sediment samples from the wetlands and pond areas may be collected by wading or boat using surface (0 to 6 inch) sediment sampling equipment. All sediment sampling equipment will be decontaminated prior to and following each use. Sample lithologies will be described in the field. Samples for laboratory analysis will be collected from the 0 to 6 inch depth interval. Samples will be placed in laboratory-supplied containers, preserved as necessary, placed on ice and delivered to the analytical laboratory.

- c. Analyze sediment samples for VOCs, SVOCs, pesticides, PCBs, metals, TPH, grain-size, and total organic carbon as indicated in Table 1.
- d. Assess the usability of sediment analytical data in accordance with the applicable guidance as described in the QAPP.
- e. Evaluate sediment sample analytical results by comparing data to screening criteria. COC concentrations in sediment samples will be compared to the lowest of the following: $TotSed_{Comb}$ PCL, and TCEQ Ecological Benchmarks for sediment provided in Table 3-3 of TCEQ Eco-risk Guidance or subsequent TCEQ guidance. These screening criteria comparisons are subject to adjustment based on background concentrations (i.e., values below background would not be considered exceedences) with background concentrations identified based on previous background samples collected in the site vicinity, background samples collected as part of this investigation, or other appropriate literature background values approved by EPA. Comparisons to ecological benchmarks may be refined based on the findings of a Tier 2 or Tier 3 ecological risk assessment (see Task 11, below).
- f. Should any sediment sample location at the perimeter of the sampled area exceed the screening criteria, then a minimum of two additional sediment samples will be collected within 200 feet of the location exceeding the screening levels. This collection of additional sediment samples will be repeated until the extent of sediment contamination has been determined. These samples will be analyzed for those COCs exceeding screening levels in the adjacent samples. Any areas where sediment sample data exceed critical PCLs will be identified as PCLE zones in the APAR.
- g. Should any COC concentrations in wetland area sediment samples exceed ecological screening criteria on a statistical basis or should any bioaccumulative COCs be detected above background in sediment samples, a Screening Level Ecological Risk Assessment (SLERA) Report will be prepared for that area. This report will be based on "Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas" (TCEQ RG-263, December, 2001) and will be submitted for TCEQ review and approval. The SLERA will provide the basis for determining whether further evaluation, such as sediment toxicity sampling, biological tissue sampling or other studies will be needed. Similarly, should any COC concentrations in barge slip and Intracoastal Waterway area sediment samples exceed ecological screening criteria on a statistical basis (95% upper confidence level on the mean) or should any bioaccumulative COCs be

detected above background in sediment samples (as determined by a means comparison test at 95% confidence level), a SLERA Report will be developed for that area.

- h. Develop ^{Fish}Sed PCLs in accordance with applicable TCEQ and EPA guidance for all sediment bioaccumulative COCs detected above background concentrations in sediment samples collected from the barge slips or Intracoastal Waterway. A Fish/Crab Sampling Work Plan will be developed for EPA review and approval for all COCs that exceed ^{Fish}Sed PCLs on a statistical basis (95% upper confidence level on the mean).

Task 9 – Investigation-Derived Waste Management

- 24. The purpose of this task is to facilitate the appropriate classification and subsequent management of all investigation-derived wastes (IDW), such as auger cuttings, well development water, and decontamination water in accordance with state and federal regulations. The following activities shall be performed by Respondents as part of Task 9:
 - a. Use process knowledge and data from environmental media samples to assist in the evaluation and classification of IDW, where possible (e.g., groundwater sample data can be used to evaluate classification of well development and purge water).
 - b. Collect composite samples from specific IDW waste streams, where environmental media data are not available (e.g., water collected after decontamination of drilling equipment).
 - c. Analyze each sampled IDW waste stream in accordance with applicable state and federal regulations, and in accordance with any facility-specific requirements of potential waste management (recycling/disposal) facilities.
 - d. Upon completion of SI activities, transport IDW to appropriate off-site waste management facilities or otherwise manage in accordance with all applicable state and federal regulations.
 - e. Secure all records documenting the IDW characteristics, waste classifications, quantities and final management locations.

Task 10 - Community Relations

- 25. The purpose of this task is to provide the local community with an explanation of SI activities and potential RA alternatives. Specifically, enable key stakeholders to be:
 - a. Aware the EPA, TCEQ and Respondents are working cooperatively to investigate the nature and extent of any contamination at the Site and to develop and evaluate RA alternatives;
 - b. Understand the technology (ies) to be used and the activities to be undertaken during the SI and RA;

- c. Provided timely, accurate and well-researched information; and
 - d. Given timely verbal and/or written responses to inquiries about the SI/RA.
26. In conjunction with the SI, Respondents shall prepare and submit a Community Involvement Plan (CIP) to EPA for review and approval, with a copy to TCEQ within sixty (60) calendar days after the effective date of this AOC. The CIP will be prepared based on applicable guidance provided in the *Superfund Community Involvement Handbook* and shall include the following information:
- a. An overview of the CIP.
 - b. A summary of Site background including Site location and description, Site history and planned SI/RA activities.
 - c. Community background, including a list of key stakeholders and potential concerns.
 - d. Community relations program approach.
 - e. The following community relations techniques and timing, including a description of the format, projected contents and distribution/update schedule for public information documents:
 - i. Creation of a stakeholder list.
 - ii. Fact sheets to be issued, by mail, to the stakeholder list before the beginning of field investigation activities and periodically thereafter through the issuance of a certificate of completion by TCEQ. The fact sheet distribution frequency will be determined by the activities being performed (i.e., greater frequency during periods of greater activity).
 - iii. Creation and maintenance of a public information repository containing copies of all final reports submitted to TCEQ and EPA at a location near the site, such as the Freeport Library.
 - iv. E-mail and telephone hotlines for public inquiries, posted on all fact sheets and on signs at the site. All questions and comments received on the hotline will be documented, a response prepared and sent to the originator with copies to EPA and TCEQ.
 - v. A public meeting or open house to be held (1) around the time of initiation of the field investigation, (2) between the submission of the final APAR and the submission of the final RAP and (3) between completion of implementation of the response action and issuance of the certificate of completion by TCEQ. Time and location of public meetings will be announced in fact sheet mailings and in advertisement in a local newspaper. Public interviews will be conducted during these meetings and a written summary of public comments and questions and the respondents' response will be prepared after each meeting and submitted to EPA and TCEQ.
 - vi. As needed, face to face dialogue with key community government officials and community stakeholders.

Task 11 – Ecological Risk Assessment

27. Using data collected as part of site investigation activities, Respondents shall complete the TCEQ Tier 1 Exclusion Criteria Checklist for the Site in accordance with applicable sections of 30 TAC 350 and TCEQ Eco-Risk Guidance. If completion of the checklist indicates that additional ecological evaluation is necessary, Respondents shall perform a Tier 2 Screening Level Ecological Risk Assessment (SLERA) in accordance with TCEQ Eco-Risk Guidance. As part of the SLERA, the COC concentrations will be compared to TCEQ benchmarks for the various media of potential concern to identify and eliminate the COCs that do not pose unacceptable ecological risk. These benchmarks can be used as the critical PCLs, if appropriate, and RA alternatives can be based on these values. Cross-media transfer will be considered when using the critical PCLs and designing additional sampling activities and/or RA alternatives. Alternatively, the Respondents can develop a conceptual ecological model, which graphically depicts the movement of COCs through media to communities and feeding guilds, and utilize an ecological hazard quotient methodology to compare exposures to no observable adverse effects levels (NOAELs) in order to eliminate COCs that pose no unacceptable risk. Medium-specific PCLs bounded by the NOAEL and the lowest observable adverse effects level (LOAEL) for those COCs that are not eliminated will be calculated and used to design appropriate RA alternatives, if necessary. The SLERA will be submitted for TCEQ review and approval.
28. At the conclusion of the Tier 2 SLERA, the Respondents shall decide that either the Tier 2 SLERA is adequate to determine that ecological threats are negligible, or the process will continue to a more detailed Tier 3 Site-Specific Ecological Risk Assessment (SSERA). If the process continues, the SLERA serves to identify exposure pathways and preliminary COCs for the SSERA by eliminating those contaminants and exposure pathways that pose negligible risks. This process can also be used to identify critical pathways or media and cleanup levels if a more detailed evaluation is not warranted or desired. A Tier 3 SSERA involves collecting site-specific data to provide a more empirical evaluation of potential ecological toxicity and risk and can be conducted when the SLERA is not appropriate or reflective of existing conditions. There are several options for conducting site-specific studies. A Tier 3 SSERA may include any or all of the following elements: tissue residue analysis and bioaccumulation studies to measure how COCs are transferred through the food chain; biomarker studies to directly measure exposure to an organism; toxicity testing to measure a specific biological endpoint following exposure; and field studies to compare with reference sites. Based on the SSERA, possible risk management recommendations may include: recommending no further action because of negligible ecological risks, developing a Tier 3 PCL and designing the RA alternative based on this value; or implementing other approaches allowed under 30 TAC 350. If a SSERA is prepared, it will be submitted for TCEQ review and approval.

Task 12 – Affected Property Assessment Report

29. The purpose of this task is to document SI activities, and identify areas, if any, within Site media where COC concentrations exceed PCLs (PCLE zones) and implementation of a RA may be required. Assuming the SI activities described in Tasks 1-9 above can be completed during a single field mobilization, Respondents shall prepare and submit two copies of a Draft APAR to TCEQ, within sixty (60) days after receipt of all validated

laboratory data. A copy of this draft APAR shall also be provided to EPA for comment and discussion with TCEQ. The APAR shall include information required by 30 TAC 350.91 and shall be submitted in the format required by TCEQ at the time of submittal.

30. The Respondents shall prepare and submit to TCEQ two copies of a Final APAR within sixty (60) calendar days after the receipt of the TCEQ's comments on the Draft APAR. The Final APAR will be responsive to the TCEQ's comments. One copy of the Final APAR shall also be provided to EPA.

Task 13 – Response Action Plan

31. The purpose of this task is to describe response objectives and propose a recommended RA alternative to address identified PCLE zones and/or other areas at the Site requiring a response action per 30 TAC 350 requirements. Toward that end, Respondents shall prepare and submit two copies of a Draft Response Action Plan (RAP) to TCEQ within sixty (60) calendar days after TCEQ approval of the Final APAR. A copy of this draft RAP shall also be provided to EPA for comment and discussion with TCEQ, and, to interested stakeholders for review and comment. A responsiveness summary will be prepared for the public comments. The RAP shall include information required by 30 TAC 350.94 and shall be submitted in the format required by TCEQ at the time of submittal. In order to maintain consistency with the National Contingency Plan, an EE/CA will be included as an appendix to the RAP. The EE/CA will describe and analyze several removal action objectives in accordance with the applicable sections of EPA Guidance 9360.0-32FS.
32. The Respondents shall prepare and submit to TCEQ two copies of a Final RAP within sixty (60) calendar days after the receipt of the TCEQ's comments on the Draft RAP. The Final RAP will be responsive to the TCEQ's comments on the draft and to community input provided as part of Task 10 activities. One copy of the Final RAP shall also be provided to EPA.

Task 14 – Implement Approved Removal Action Alternative

33. Consistent with the requirements of 30 TAC 350, Respondents shall implement the recommended removal action alternative approved in the Final RAP. The specific components and time frame for implementation of the removal action will be specified in the RAP.
34. Upon completion of the RA, Respondents shall prepare and submit to TCEQ two copies of a Draft Response Action Completion Report (RACR). A copy of this draft RACR shall also be provided to EPA and, upon request, to interested stakeholders in accordance with Task 10.
35. The Respondents shall prepare and submit to TCEQ two copies of a Final RACR within sixty (60) calendar days after the receipt of the TCEQ's comments on the Draft RACR. The Final RACR will be responsive to the TCEQ's comments on the draft and to community input provided as part of Task 10 activities. One copy of the Final RACR shall be provided to EPA as the basis for delisting the Site.

APPENDIX A

SCHEDULE OF DELIVERABLES

SITE INVESTIGATION AND REMOVAL ACTION GULFCO MARINE MAINTENANCE SUPERFUND SITE

DELIVERABLES	DUE DATES (CALENDAR DAYS)
1. VCP Application	Application to be submitted to TCEQ within thirty (30) days after the Effective Date of the AOC.
2. Draft QAPP	Draft due to EPA (copy to TCEQ) within sixty (60) days after effective date of the AOC. Final due within twenty (20) days of receipt of EPA comments.
3. Draft CIP	Draft due to EPA (copy to TCEQ) within sixty (60) days after effective date of the AOC. Final due within twenty (20) days of receipt of EPA comments.
4. SLERA Report	Draft due to TCEQ within sixty (60) days of identification of ecological screening criteria exceedence or detection of bioaccumulative COCs above background in sediment samples. Final due within 20 days of receipt of TCEQ comments.
5. Fish/Crab Sampling Work Plan	Draft due to EPA (copy to TCEQ) within sixty days after COCs in barge slip and Intracoastal Waterway sediment samples exceeding ^{Fish} Sed PCLs identified.
6. Draft APAR	Draft due to TCEQ (copy to EPA) within sixty (60) days after receipt of all validated laboratory data, including supplemental data required by any work plans required by EPA pursuant to the Ecological Problem Formulation Report and Fish/Crab Sampling Work Plan.
7. Final APAR	Final due to TCEQ (copy to EPA) within sixty (60) days after receipt of the TCEQ's comments on the Draft APAR.
8. Draft RAP	Draft due to TCEQ (copy to EPA for informational purposes) within sixty (60) days after TCEQ approval of Final APAR.
9. Final RAP	Final due to TCEQ (copy to EPA for informational purposes) within sixty (60) days after receipt of the TCEQ's comments on the Draft RAP.
10. Implement Removal Action	Schedule established in RAP.
11. Draft RACR	Draft due to TCEQ (copy to EPA) upon completion of removal action.

DELIVERABLES	DUE DATES (CALENDAR DAYS)
12. Final RACR	Final due to TCEQ (copy to EPA) within sixty (60) days after receipt of the TCEQ's comments on the Draft RACR.

TABLE 1 - SAMPLE ANALYSES SUMMARY

SOW TASK NUMBER	SAMPLE TYPE	PROJECTED NUMBER OF SAMPLES ¹	SAMPLE ANALYSES	ANALYTICAL METHOD ²
3	Soil (cap)	4	Percent Passing No. 200 Sieve Atterburg Limits Vertical Hydraulic Conductivity	ASTM D 1140 ³ ASTM D 4318 ³ COE EM-1110-2-1906 ⁴
4	Soil	183	Volatile Organics Semi-volatile Organics Total Petroleum Hydrocarbons (TPH) Organochlorine Pesticides PCBs Metals Mercury Moisture Content (Total Percent Solids)	EPA 8260 EPA 8270 TX 1005 ⁵ EPA 8081 EPA 8082 EPA 6010 EPA 7470 Std. Methods 2540G ⁶
4	Soil	6	Soil Bulk Density pH Specific Gravity (used to calculate porosity) Total Organic Carbon	EPA 9045 ASTM D-854 ³
6	Groundwater	50	Volatile Organics Semi-volatile Organics Total Petroleum Hydrocarbons (TPH) Organochlorine Pesticides PCBs Metals Mercury	EPA 8260 EPA 8270 TX 1005 ⁵ EPA 8081 EPA 8082 EPA 6010 EPA 7470
6	Groundwater	2 (1 north of Marlin and 1 south of Marlin)	Total Dissolved Solids Major Anions (Ca, Mg, K, Na) Major Cations (SO ₄ , Cl) Alkalinity (Field)	EPA 160.1 ⁷ EPA 6010 or 6020 EPA 9038 and 9251 Hach 8203 ⁸
6	DNAPL	Wells where DNAPL is present	Specific Gravity Volatile Organics Semi-volatile Organics Organochlorine Pesticides	EPA 8260 EPA 8270 EPA 8081
7	Surface Water	21	Volatile Organics Semi-volatile Organics Organochlorine Pesticides PCBs Metals (filtered and unfiltered) Mercury Hardness	EPA 8260 EPA 8270 EPA 8081 EPA 8082 EPA 6010 EPA 7470 EPA 220.7 ⁷
8	Sediment	39	Volatile Organics Semi-volatile Organics Total Petroleum Hydrocarbons (TPH) Organochlorine Pesticides PCBs Metals Mercury Total Organic Carbon Grain-Size Distribution	EPA 8260 EPA 8270 TX 1005 ⁵ EPA 8081 EPA 8082 EPA 6010 EPA 7470 ASTM C-136 ⁴

Note:

¹ Initial projected of number of samples for laboratory analysis. Number may be reduced by use of field analytical procedures (subject to Demonstration of Method Applicability) or increased due to addition of background or additional delineation samples. Estimate does not include QA/QC samples.

² Unless indicated otherwise, analytical methods are from EPA SW-846 "Test Methods for Evaluating Solid Waste."

³ Method from "ASTM 2005 Annual Book of Standards", Vol. 04.08.

⁴ Method from U.S. Army Corps of Engineers Manual, Appendix VII, 30 November 1970 (for falling-head tests).

⁵ Method from TCEQ Specification Rev. 03 (June 1, 2001). The soil and groundwater sample with the highest TPH concentration by Method TX1005 will be further fractionated by Method TX1006.

⁶ Method from "Standard Methods for Examination of Water and Wastewater."

⁷ Method from EPA 600/4-79-020 "Methods for Chemical Analysis of Water and Wastes."

⁸ Method from Hach Water Analysis Handbook.